Fig.1 (Prior Art)

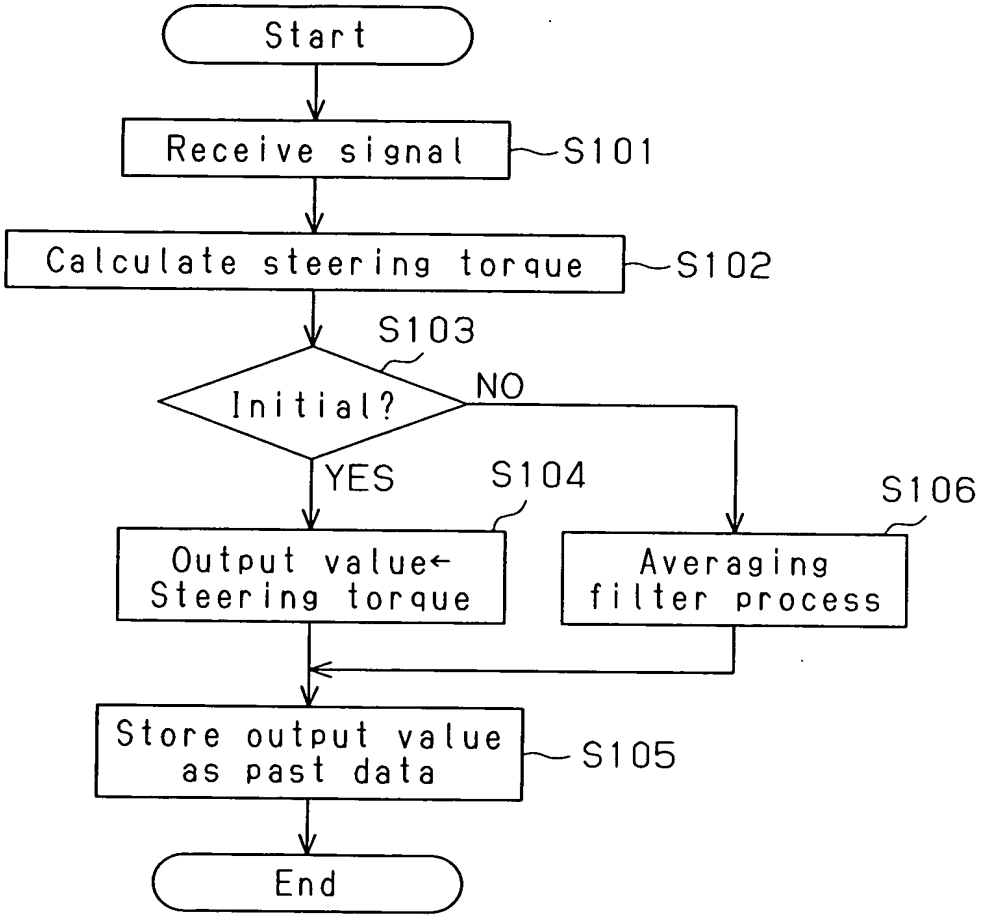


Fig.2

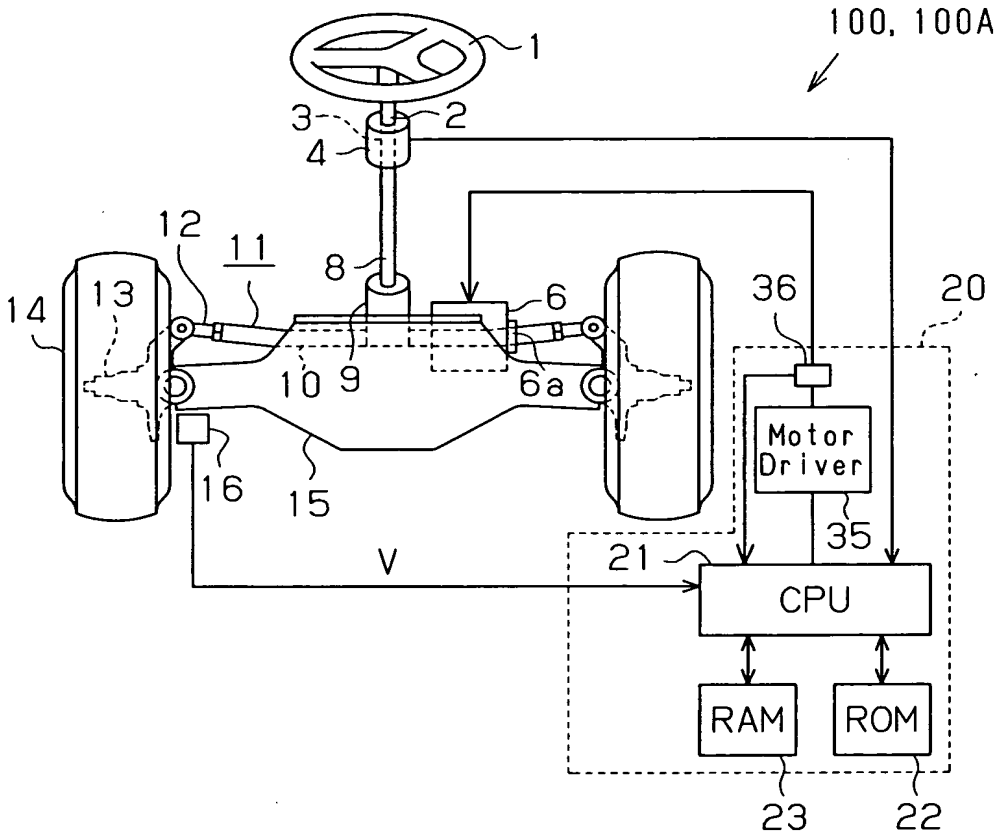

100, 100A
1
2
3
4
8
6
6a
9
10
11
12
13
14
15
16
V
36
20
Motor Driver
35
21
CPU
RAM
ROM
23
22

Fig.3

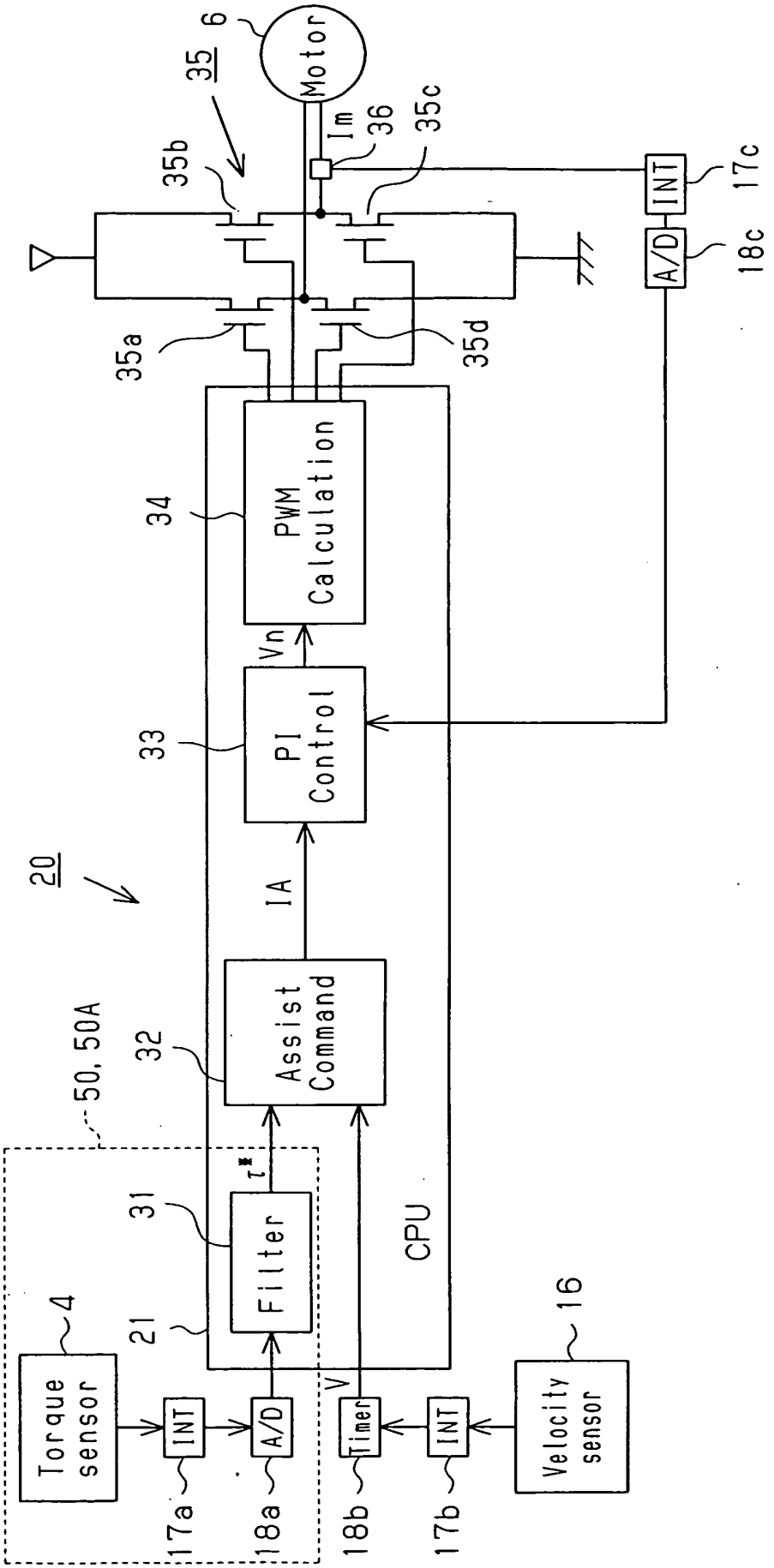

Motor
6
35
Im
36
35c
35b
INT
17c
A/D
18c
35a
35d
PWM Calculation
34
Vn
PI Control
33
20
IA
Assist Command
32
50, 50A
τ*
Filter
31
CPU
21
4
Torque sensor
INT
A/D
17a
18a
V
Timer
INT
18b
17b
16
Velocity sensor

Fig.4

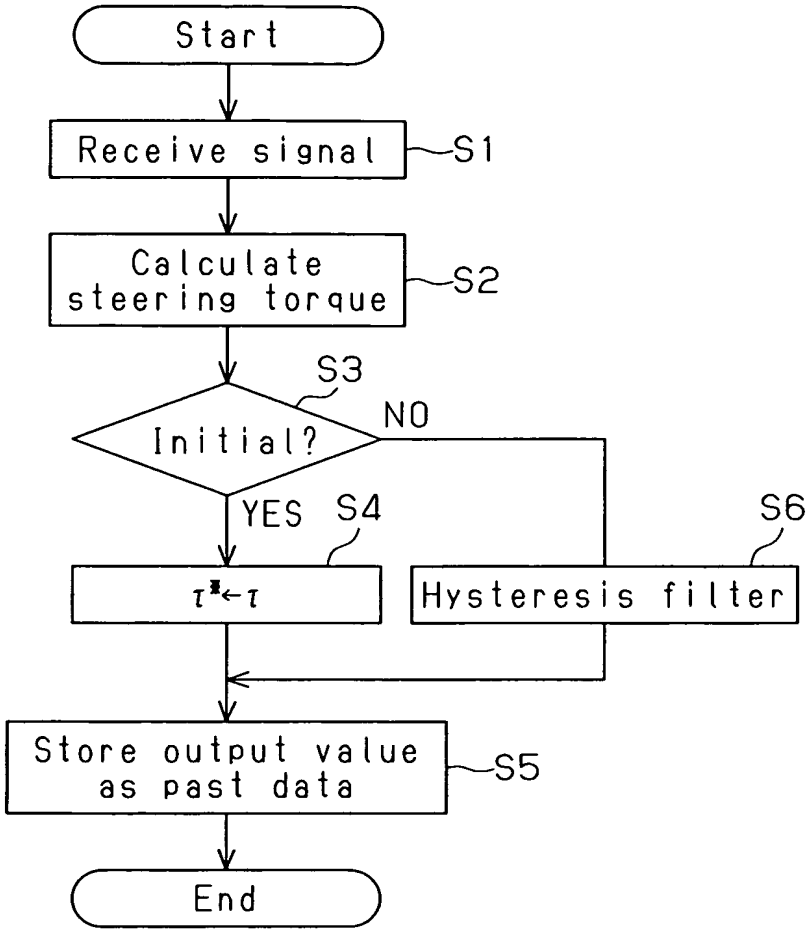

Start
Receive signal
S1
Calculate steering torque
S2
S3
Initial?
NO
YES
S4
S6
τ*←τ
Hysteresis filter
Store output value as past data
S5
End

Fig.5

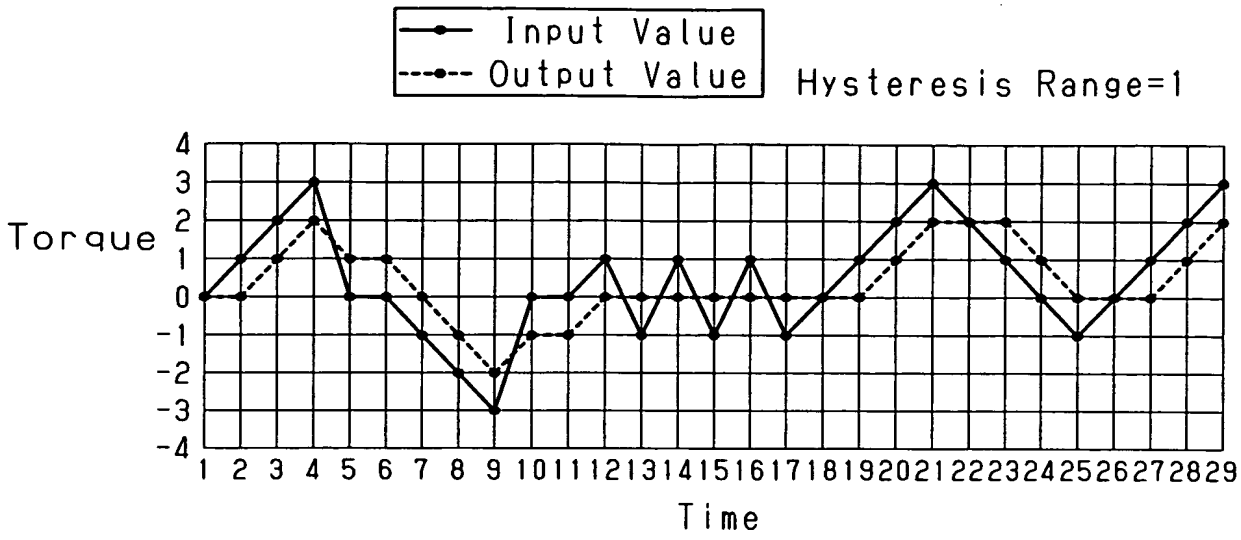

Input Value
Output Value
Hysteresis Range=1
Torque
4
3
2
1
0
-1
-2
-3
-4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
Time

Fig.6

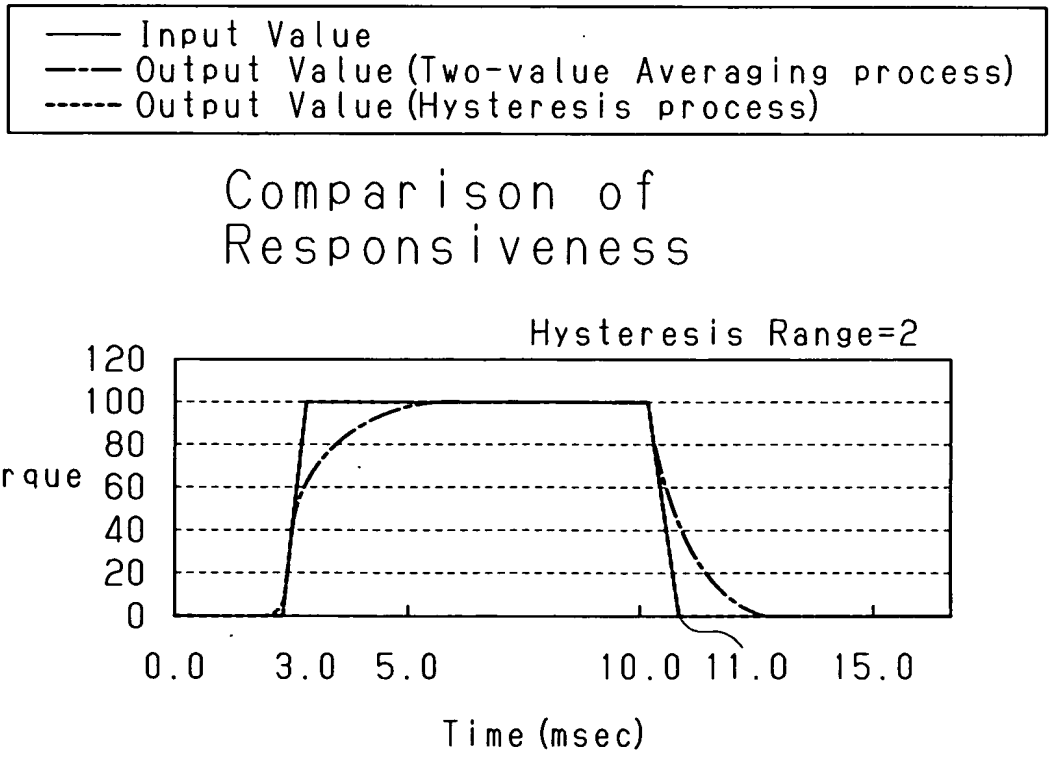
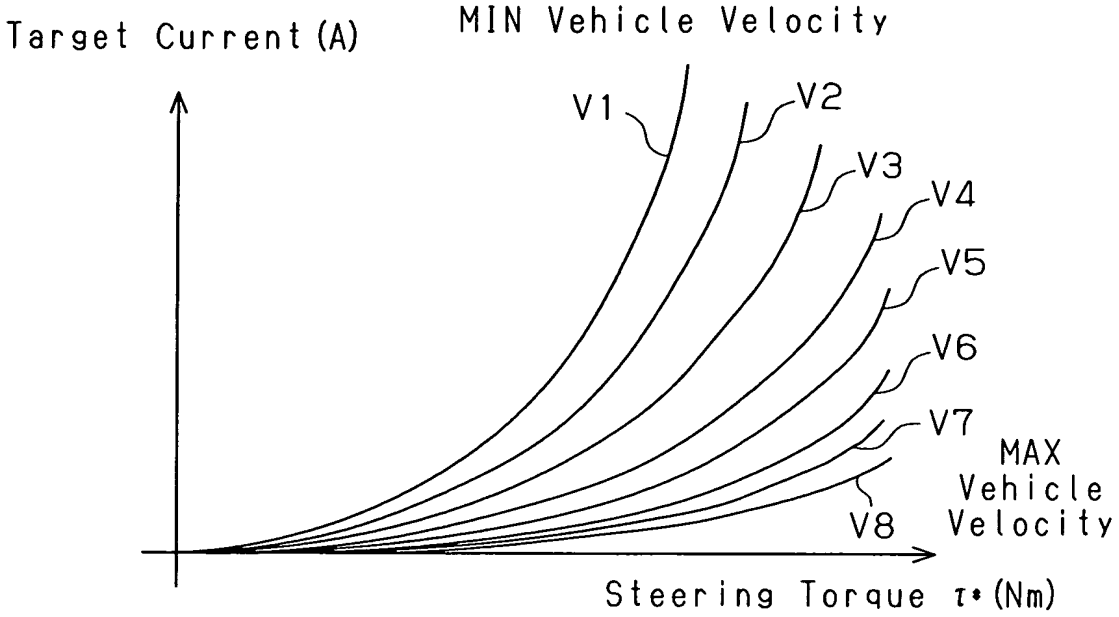
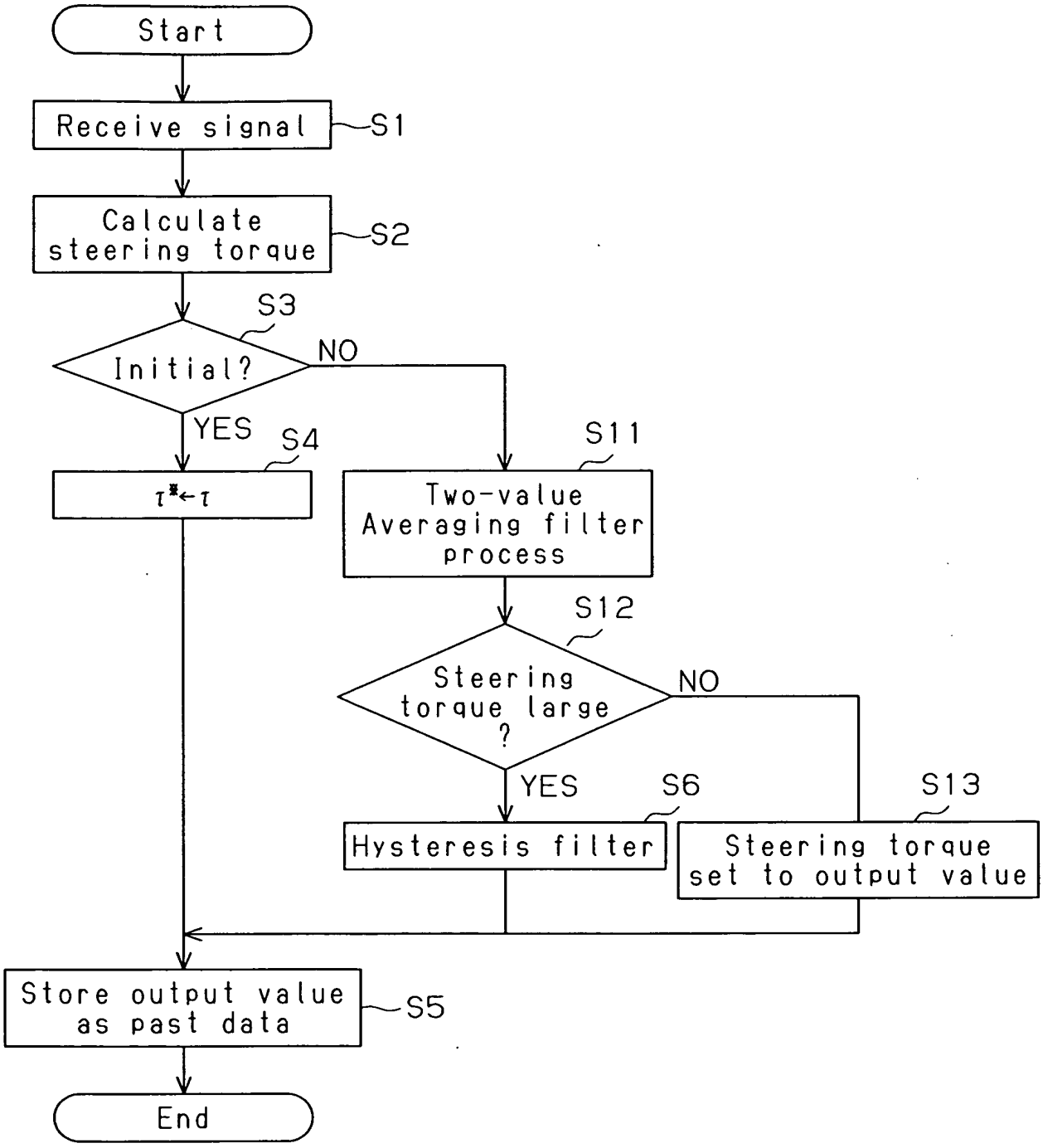

Input Value
Output Value (Two-value Averaging process)
Output Value (Hysteresis process)
Comparison of Responsiveness
Hysteresis Range=2
Torque
120
100
80
60
40
20
0
0.0
3.0
5.0
10.0
11.0
15.0
Time (msec)

Fig.7



Assist Map

Fig.8


Start
Receive signal
S1
Calculate steering torque
S2
S3
Initial?
NO
YES
S4
τ*←τ
S11
Two-value Averaging filter process
S12
Steering torque large ?
NO
YES
S6
Hysteresis filter
S13
Steering torque set to output value
Store output value as past data
S5
End